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Review Article

Nurse-Controlled Sedation Protocols in the Intensive Care Unit: An Evidence-Based Traditional Review

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Abstract

Sedation and analgesia management in intensive care units is one of the fundamental care processes that directly affects mechanical ventilation duration, patient safety, and clinical outcomes. Sedation levels are determined based on criteria such as the patient's level of consciousness, preservation of airway reflexes, adequacy of spontaneous ventilation, and cardiovascular stability. The dose and rate of administration of sedative and analgesic agents, as well as patient-specific clinical characteristics, determine the depth of sedation; inadequate or excessive sedation is associated with patient-ventilator mismatch, haemodynamic instability, and prolonged mechanical ventilation. Therefore, clinical guidelines recommend that sedation management be goal-oriented, protocol-based, and conducted within a framework of systematic assessment. In Türkiye, sedation management is carried out according to a plan determined by the physician, but the effectiveness of the process largely depends on the continuous assessment and decision-making process carried out by a nurse at the bedside. Nurses titrate medications by assessing the patient's immediate clinical condition and depth of sedation, detect potential side effects early, and actively manage the achievement of goals. In this context, nurses are not merely implementers; they are healthcare professionals who play a central role in ensuring that sedation is safe, effective, and individualised. This review examines the effects of nurse-controlled sedation protocols on the mechanical ventilation process and the contribution of nurses' clinical knowledge and practices in sedation management to patient outcomes, based on findings from the current literature.

Keywords: Clinical protocols, Conscious sedation, Evidence-Based practice, Intensive Care Units, Nursing assessment.

Özet

Yoğun bakım ünitelerinde sedasyon ve analjezi yönetimi, mekanik ventilasyon süresi, hasta güvenliği ve klinik sonuçları doğrudan etkileyen temel bakım süreçlerinden biridir. Sedasyon düzeyleri; hastanın bilinç durumu, hava yolu reflekslerinin korunması, spontan ventilasyon yeterliliği ve kardiyovasküler stabilite gibi ölçütlere göre belirlenmektedir. Sedatif ve analjezik ajanların dozu, uygulama hızı ve hastaya özgü klinik özellikler sedasyon derinliğini belirlemekte; yetersiz veya aşırı sedasyon uygulamaları hasta-ventilatör uyumsuzluğu, hemodinamik instabilite ve mekanik ventilasyon süresinin uzaması ile ilişkilendirilmektedir. Bu nedenle klinik kılavuzlar, sedasyon yönetiminin hedefe yönelik, protokole dayalı ve sistematik değerlendirme çerçevesinde yürütülmesini önermektedir. Türkiye'de sedasyon yönetimi hekim tarafından belirlenen plan doğrultusunda yürütülmekle birlikte, sürecin etkinliği büyük ölçüde hemşirenin yatak başında gerçekleştirdiği sürekli değerlendirme ve karar verme sürecine dayanmaktadır. Hemşireler, hastanın anlık klinik durumunu ve sedasyon derinliğini değerlendirerek ilaç titrasyonunu yapmakta, olası yan etkileri erken saptamakta ve hedeflere ulaşılmasını aktif biçimde yönetmektedir. Bu bağlamda hemşire, yalnızca uygulayıcı değil; sedasyonun güvenli, etkili ve bireyselleştirilmiş biçimde sürdürülmesinde merkezi rol üstlenen bir sağlık profesyoneli. Bu derlemede, hemşire kontrollü sedasyon protokollerinin mekanik ventilasyon süreci üzerindeki etkileri ile hemşirelerin sedasyon yönetimindeki klinik bilgi ve uygulamalarının hasta sonuçlarına katkısı, güncel literatür bulguları doğrultusunda ele alınmıştır.

Anahtar Kelimeler: Klinik protokoller, Bilinçli sedasyon, Kanıta dayalı uygulamalar, Yoğun Bakım Üniteleri, Hemşirelik değerlendirmesi.



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INTRODUCTION

Sedation and analgesia management in intensive care units (ICUs) play a pivotal role in ensuring the safe and controlled delivery of monitoring and treatment processes in critically ill patients. Inadequate or excessive sedation, as well as insufficient pain control, may result in numerous adverse clinical outcomes. Therefore, sedation and analgesia practices should not be implemented arbitrarily but rather planned in accordance with clearly defined therapeutic targets. Protocol-based approaches to sedation and analgesia management aim to facilitate the systematic assessment of sedation depth and to promote greater consistency in the delivery of care. However, particularly in ICU settings where standardized practices are limited or resources are constrained, the absence of structured sedation protocols represents a significant concern in terms of patient safety (Boncyk et al., 2024; Hariharan & Garg, 2017; Temesgen et al., 2021).

In this context, the effective implementation of sedation protocols and the provision of sedation practices aligned with patient comfort are closely associated with nurses' knowledge, attitudes, and clinical competencies in this domain. Nurses who are proficient in assessing sedation levels and recognizing potential complications at an early stage contribute substantially to ensuring that the sedation process is conducted safely and in accordance with individual patient needs. Evidence indicates that nurse-led sedation protocols enhance sedation quality, improve pain management, and reduce sedative exposure. Through continuous patient assessment and close monitoring of medication administration in the ICU, nurses assume a central role in sedation management (Al-Bkkour et al., 2025; Kalkan Uğurlu & Küçük Alemdar, 2025). The aim of this review is to examine current evidence regarding nurse-controlled sedation protocols in intensive care from a nursing perspective and to evaluate their impact on patient safety and clinical outcomes.

1. Overview of Sedation and Analgesia Management in the ICU

Sedation refers to the controlled suppression of consciousness through pharmacological agents and is conceptualized along a continuum extending from full alertness to minimal and deep sedation (Hara et al., 2023). The presence of invasive procedures such as surgical interventions, endotracheal intubation, and drain placement increases the requirement for analgesic and sedative medications (Schianchi & Harris, 2025). Patients receiving mechanical ventilation in the ICU are exposed not only to respiratory failure but also to significant physiological and psychological stressors, including pain, anxiety, and agitation. This stress response activates the sympathetic nervous system, resulting in tachycardia, hypertension, and increased oxygen consumption, accompanied by marked haemodynamic and metabolic alterations. In this context, sedation and other life-support interventions are employed to control stress-related adverse effects, maintain adequate gas exchange, prevent patient-ventilator asynchrony, and reduce ventilator-associated complications, including pneumonia and the need for tracheostomy (Li et al., 2025; Yadav et al., 2025). Failure to maintain effective and controlled sedation management may lead to either over-sedation or under-sedation. Oversedation has been associated with prolonged mechanical ventilation, extended hospital length of stay, increased infection risk, and the development of withdrawal symptoms. Conversely, inadequate or inappropriate sedation may predispose patients to agitation and delirium, thereby increasing the likelihood of serious complications such as unplanned extubation and accidental removal of catheters (Dreyfus et al., 2017; Li et al., 2025). Pain is a frequent and clinically significant problem in ICU patients and directly influences the quality of care. The planned and holistic management of pain plays a crucial role in improving care processes in critically ill patients. However, due to communication limitations commonly observed in ICU populations, accurate and reliable pain assessment is not always feasible. For this reason, pain evaluation is often conducted using observational tools. Instruments such as the Nonverbal Pain Scale

and the Behavioral Pain Scale provide objective guidance for assessing pain, particularly in intubated or sedated patients. Although adequate analgesia may reduce the need for sedation in some patients, sedative medications are frequently required to maintain patient comfort, ensure safety, and support synchrony with mechanical ventilation. This highlights that sedation in the ICU is an integral component of care that must be addressed in conjunction with pain management. Accordingly, sedation practices should be planned to complement analgesia, taking into account the patient's clinical condition and the nature of the interventions performed. The safe and effective implementation of analgesia and sedation requires regular and reliable pain assessment (Pearson & Patel, 2020; Pota et al., 2022; Stretanski et al., 2025). In the ICU setting, pain control and sedation needs are often managed concurrently during unpleasant or painful procedures. The objective of such interventions is to reduce pain perception and maintain patient comfort through the simultaneous administration of analgesia and sedation. In clinical practice, this is commonly achieved through the controlled use of sedative agents in combination with analgesics, frequently involving short-acting benzodiazepines (e.g., midazolam) and opioid analgesics (e.g., fentanyl). This approach facilitates adequate analgesia while achieving a balanced level of sedation (Benzoni et al., 2025). The effectiveness of sedation and analgesia management in critically ill patients is closely associated with the knowledge and clinical competencies of nurses, who assume a primary caregiving role in the ICU. Achieving desired outcomes in sedation therapy depends on nurses' understanding of sedation principles, assessment strategies, medication selection, and potential complications. Early recognition of signs of inadequate sedation or analgesia, together with the appropriate use of validated assessment tools and protocols, supports timely and goal-directed interventions. Given their continuous and direct contact with patients, nurses play a central role in ensuring the safe and effective continuation of sedation and analgesia management. This process requires a comprehensive understanding of the clinical pharmacology of sedative agents, ongoing assessment of sedation requirements using appropriate methods, and the accurate administration and monitoring of medications to ensure safe clinical effects (Kavurmacı & Tan, 2019; Lia et al., 2023).

2. Sedation Levels, Assessment Tools, and Clinical Management Principles

The classification of sedation levels is based on the patient's level of consciousness, preservation of airway reflexes, adequacy of spontaneous ventilation, and cardiovascular function. The depth of sedation administered varies depending on the dose and rate of administration of the sedative or analgesic agent and individual patient characteristics, and may result in minimal, moderate, or deep sedation levels. In clinical practice, it should be noted that even a sedative agent with minimal effect can progress to deeper levels of sedation with increased dosage; this situation may adversely affect patients' haemodynamic and metabolic stability due to excessive or inadequate sedation. Therefore, PADIS (Pain, Agitation/Sedation, Delirium, Immobility, Sleep Disruption) clinical practice guidelines recommend that pain and sedation management in critically ill adults be conducted within a systematic, protocol-based, and stepwise approach. Furthermore, when assessing the level of sedation, it is not sufficient to focus solely on the drugs used; the stress caused by the invasive procedure, the patient's clinical response, and the effect profile of sedative agents must be considered together (Devlin et al., 2018; Hara et al., 2023; Kalkan Uğurlu & Küçük Alemdar, 2025).

3. Nurse-Controlled Sedation Protocols and the Clinical Monitoring Process

Nurse-controlled sedation is most commonly implemented during short-term bedside procedures. These include central venous catheter insertion, arterial catheterization, drain changes, tracheostomy care, preparation for bronchoscopy, and invasive wound care. It is also utilized during acute agitation

episodes when non-pharmacological interventions are insufficient, as well as prior to bedside imaging or neurological evaluations such as electroencephalography (EEG) and computed tomography (CT) where patient immobility is required to enhance procedural accuracy. In addition, nurse-controlled sedation may be preferred to manage anxiety related to invasive devices in clinically stable patients who do not require continuous deep sedation but experience difficulty synchronizing with the ventilator. In such cases, light to moderate sedation may be administered to ensure comfort and optimize ventilatory compliance (Çelik & Aydın, 2017; Yadav et al., 2025). Current evidence supports the implementation of daily sedation interruption to allow regular reassessment of sedation requirements and to facilitate safe neurological monitoring. Evidence-based practices recommend that, in appropriate patient populations, sedation interruption be conducted in a planned and structured manner at least once daily. This approach aims to maintain the lowest effective level of sedation without precipitating agitation and requires individualized titration of sedative agents based on patient-specific characteristics, disease trajectory, and drug tolerance. Standardized assessment tools such as the Richmond Agitation-Sedation Scale (RASS) and the Sedation-Agitation Scale (SAS) provide objective guidance in determining whether sedation can be safely reduced. Nevertheless, sedation interruption is not without risks and necessitates close monitoring. Following dose reduction, patients may become aware of invasive tubes and catheters, potentially leading to unintentional removal attempts and complications such as laryngeal injury or edema. Therefore, the management of sedation interruption requires a multidisciplinary and individualized approach tailored to patient characteristics and overall clinical condition (Reyes-Bello et al., 2024; Yadav et al., 2025). During this process, the knowledge and clinical competence of intensive care nurses who play an active role in sedation practices in monitoring sedation depth, adjusting the doses of sedative agents administered via infusion, and evaluating the clinical effects of medications is essential for maintaining sedation safely (Ramoo et al., 2016). The daily sedation break is a structured approach that involves the planned discontinuation of sedative infusions, allowing the patient to awaken spontaneously, and closely monitoring the patient during this process. The main objectives of this approach are to prevent the accumulation of sedative drugs, reduce total sedative exposure, and reliably assess the patient's neurological status. Following sedation discontinuation, the patient is assessed for signs of restlessness, pain, or agitation that may arise during the awakening process; simultaneously, the level of consciousness, neurological status, and respiratory functions are systematically monitored. Confirming that the patient is awake, cooperative, and able to respond appropriately allows for the observation of tolerance to sedative withdrawal and determination of readiness for endotracheal extubation. Sedative treatment may be restarted according to clinical need; however, if significant agitation or intolerance develops, sedation may need to be resumed at an earlier stage. When re-administering sedation, sedative agents are preferred at lower initial doses compared to the previous administration, and gradual titration is performed, targeting the lowest effective dose based on the patient's clinical response (Graham et al., 2024; Nassar & Park, 2014). The safe and effective management of the process is directly related to the bedside nurses' capacity for continuous clinical monitoring, early risk identification, and timely intervention. Reduced sedation levels support the proper performance of neurological examinations, facilitate the weaning process from the ventilator, reduce hospital stay duration, and contribute to more effective assessment of pain and discomfort (Graham et al., 2024). In this regard, it is reported that structured assessments and trials are conducted at specific times of the day as part of protocol-based sedation withdrawal and extubation management led by nurses. It has been demonstrated that systematic assessments initiated early in the morning (at 06:00) facilitate earlier completion of extubation (by 08:00), enhance patient comfort, and contribute to the

organisation of nursing workflows in alignment with circadian rhythms. The clinical approach planned during this timeframe stands out as a practice that increases the success rate of weaning from the ventilator, while also supporting clinical decision-making processes by ensuring that assessments are completed prior to physician visits, in line with standard intensive care morning rounds (Xue et al., 2025).

4. The Effects of Nurse-Controlled Sedation Protocols on the Mechanical Ventilation Process

Sedation and analgesia management in intensive care units plays a significant role in ensuring patient safety, reducing the duration of mechanical ventilation, and improving care outcomes. Nurse-controlled sedation protocols developed in this context are structured practices based on current guidelines (PADIS) that aim to systematically monitor the patient's level of sedation and minimise continuous intravenous sedative infusions. Under these protocols, sedatives and analgesics can be titrated and administered by nurses under physician supervision when necessary (Çelik & Aydın, 2017; Grecu, 2023). Protocol-based approaches implemented by nurses contribute to reducing the use of sedatives and analgesics, thereby supporting the prevention of excessive sedation; consequently, they can minimise the risk of developing drug tolerance and withdrawal symptoms. At the same time, the active involvement of bedside nurses in clinical decision-making processes supports the standardisation of care and strengthens multidisciplinary team collaboration (Schianchi & Harris, 2025). With the reduction in sedative exposure, nurses who spend more time with patients and have the opportunity to closely monitor their clinical condition are able to detect clinical signs. These signs indicating that patients are ready to be weaned off the ventilator at an earlier stage. During this process, nurses can contribute to shortening the pre-weaning period and accelerating the patient's weaning process by initiating predefined protocol steps without unnecessary delays. Autonomous decision-making areas defined within the protocols reduce delays associated with hierarchical communication or waiting for physician orders; they improve care coordination by strengthening interdisciplinary teamwork and communication. These protocol-based approaches have been shown to positively contribute to respiratory outcomes, such as a reduction in the duration of mechanical ventilation and an increase in the number of ventilator-free days, starting with process improvements such as a decrease in the use of continuous sedative infusion and standardisation of care. It may also be associated with important clinical outcomes such as reduced intensive care and hospital stay duration, increased patient safety, contribution to cost-effectiveness, decreased incidence of delirium, and reduced intensive care mortality (Çelik & Aydın, 2017; Grecu, 2023; Wang et al., 2025).

5. Evidence-Based Practices in the Use of Sedation and Analgesia

The PADIS 2018 clinical practice guidelines recommend the use of dexmedetomidine for the management of delirium in adult patients undergoing mechanical ventilation where agitation delays extubation or weaning from the ventilator; however, this recommendation is based on low-quality evidence. The same guidelines conditionally recommend dexmedetomidine over propofol for sedation in patients admitted to the intensive care unit when achieving mild sedation or reducing delirium is clinically prioritised, and this recommendation is supported by moderate certainty of evidence (Devlin et al., 2018).

Findings from systematic reviews and meta-analyses indicate that dexmedetomidine can reduce the incidence of delirium and the duration of mechanical ventilation compared to other sedative agents. However, an increased risk of hypotension and bradycardia has been reported when compared to propofol and benzodiazepines. Nevertheless, in most intensive care patients, the clinical benefits

provided by dexmedetomidine are considered to outweigh the potential cardiovascular side effects, and the risk–benefit balance is assessed in favour of this agent (Lewis et al., 2022).

In selected patients undergoing prolonged mechanical ventilation and initially sedated with midazolam, switching to dexmedetomidine and/or propofol therapy has been shown to significantly shorten weaning and recovery times compared to continuing sedation with midazolam. In this context, the sequential use of midazolam and dexmedetomidine is considered an effective and safe sedation strategy in critically ill patients on mechanical ventilation who require prolonged sedation (Zhou et al., 2022).

In intensive care patients on mechanical ventilation, remifentanyl enables more controlled management of sedation and analgesia due to its rapid onset of action, short elimination half-life, and non-accumulative pharmacokinetic properties; with these characteristics, it stands out as an agent that can shorten the duration of mechanical ventilation and the length of stay in the intensive care unit. Therefore, remifentanyl is considered a suitable analgesic option, particularly in patient groups where optimising the weaning process from the ventilator is targeted (Yang et al., 2021).

In the current PADIS 2025 clinical practice guidelines, it is recommended with moderate certainty of evidence that dexmedetomidine should be preferred over propofol for sedation in adult patients undergoing mechanical ventilation and admitted to the intensive care unit, particularly in situations where achieving mild sedation and/or reducing delirium is a priority. In contrast, it is emphasised that the available evidence is insufficient to make a recommendation for or against the use of benzodiazepines for anxiety management in adult patients monitored in the intensive care unit (Lewis et al., 2025).

The appropriate management of sedation in critically ill patients receiving mechanical ventilation is considered a fundamental requirement for improving both early and long-term clinical outcomes. Accordingly, it is recommended that intensive care practitioners structure their sedation practices within evidence-based strategies and adopt a standardised approach. The safe and effective maintenance of sedation relies not only on the existence of protocols but also on advanced clinical assessment and decision-making competencies supported by sufficient knowledge infrastructure. While sedation management is an integral component of intensive care practice, it is a process that requires careful and continuous monitoring due to the potential risks it poses to patient safety. In this context, nurses' high awareness of the possible adverse effects of sedation treatment and recommendations regarding current sedation practices is critical for the quality and safety of sedation care (Ramoo et al., 2016).

6. Use of Sedation Protocols in Türkiye and Around the World

Guidelines, algorithms and protocol-based approaches based on regular assessment of sedation levels are recommended to increase the effectiveness of sedation management in intensive care patients. Within the framework of these approaches, key strategies include implementing daily sedation breaks, targeting the lowest possible sedation levels, and systematically reassessing sedation and analgesia requirements. Sedation protocols led by nurses enable real-time adjustment of sedative doses based on patients' sedation scores; Standardised measurement tools such as the RASS and the SAS are widely used to monitor sedation levels (Aitken et al., 2016). Despite the existence of current protocols, sedation guidelines are not sufficiently reflected in clinical practice; the levels of use of sedation protocols vary between countries and regions. For example, it is reported that sedation protocols are effectively implemented in less than half of intensive care units in Canada, the United States and

Denmark, while the rates are 19.4%, 31% and 61.4% in Poland, Japan and Spain, respectively. The global usage rate of sedation protocols is reported to be 65%, while the regional distribution shows rates of 49% in Europe, 80% in Asia, and 83% in North America. In Türkiye, sedation protocols are determined by physicians in 37.3% of ICUs and the rate of written sedation protocols is low (Ürkmez et al., 2019).

CONCLUSION

Nurse-controlled sedation protocols in intensive care are among the critical care approaches for ensuring patient safety and improving clinical outcomes. Current evidence shows that these protocols enable regular and systematic monitoring of sedation levels and have positive effects on mechanical ventilation duration and length of stay in intensive care by reducing sedative exposure. Protocol-based approaches led by nurses support the weaning process, contribute to reducing the risk of delirium, and strengthen standardisation in care processes. However, the lack of standardised and widespread implementation of nurse-controlled sedation protocols in our country creates a significant gap in clinical practice. Sedation and analgesia management is a process that requires a high level of clinical knowledge, experience, and continuous assessment; it should not be overlooked that nurses who do not have sufficient experience and clinical competence in this area may experience difficulties in managing the sedation process in accordance with the individual needs of the patient, which may lead to adverse outcomes in terms of patient safety. This situation may lead to consequences that could directly affect patient safety, such as inadequate or excessive sedation, patient–ventilator mismatch, and an increased risk of complications. While international guidelines support the effectiveness of nurse-controlled sedation protocols, the integration and sustainability of these protocols into clinical practice may vary depending on the institutional structure, care model, and team organisation. In this context, strengthening nurses' knowledge and clinical competence in sedation and analgesia management, developing standard protocols, and supporting multidisciplinary team collaboration are key requirements for the safe and effective implementation of nurse-controlled sedation protocols.

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